



PATENT
Docket No. 150.0062 0109

#8/13
T. BELL
7.15.02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Zane Drussel et al.)
Serial No.: 09/865,336)
Confirmation No.: 3557)
Filed: 25 May 2001)
For: SINGULATION METHODS AND SUBSTRATES FOR USE WITH SAME

Group Art Unit: 2827
Examiner: Norris

AMENDMENT AND RESPONSE

Assistant Commissioner for Patents
Washington D.C. 20231

Dear Sir:

In response to the Office Action dated 27 March 2002, please amend the above identified application as follows:

In the Claims

Please add new claims 69-78 and amend claims 22, 25-26, 28, and 31-32. The new and amended claims are provided below in clean form. Per 37 C.F.R. § 1.121, amended claims are also shown in Appendix A with notations to indicate changes made (for convenience, all pending claims, including those added hereby, are provided in Appendix A).

22. **(Once Amended)** A circuit board substrate assembly comprising a substrate material having first and second opposed edges, the substrate material comprising:
- a plurality of circuit forming regions comprising at least one pair of adjacent circuit forming regions;
- a first interconnection region and a second interconnection region, wherein the first interconnection region extends along the first edge and is located between the first edge and the plurality of circuit forming regions, wherein the second interconnection region extends along the

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second edge and is located between the second edge and the plurality of circuit forming regions;
and

a single opening defined in the substrate material between each pair of adjacent circuit forming regions, wherein the single opening extends into at least portions of both the first interconnection region and second interconnection region.

25. (Once Amended) The assembly of claim 23, wherein the single opening comprises a first and second opposing end portion with the first end portion thereof lying along a first singulation axis of the substrate material parallel to the longitudinal axis and the second end portion of the single opening lying along a second singulation axis of the substrate material parallel to the longitudinal axis.

26. (Once Amended) The assembly of claim 23, wherein the single opening is a single slot extending generally orthogonal to the longitudinal axis.

28. (Once Amended) The assembly of claim 27, wherein the single opening has a length that is orthogonal to the longitudinal axis, and further wherein the length of the single opening is greater than the length of the at least one of the plurality of individual circuit board portions.

31. (Once Amended) The assembly of claim 22, wherein the single opening comprises a slot extending into at least portions of the first and second interconnection regions.

32. (Once Amended) The assembly of claim 22, wherein the single opening between each pair of adjacent circuit forming regions is configured such that the plurality of circuit forming regions are separable by using a material removal tool operable to move along one or more parallel singulation axes to remove at least portions of the first and second interconnection regions.

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69. (New) A circuit board substrate assembly comprising:

a substrate material having first and second opposed edges, the substrate material comprising:

a plurality of circuit forming regions comprising at least one pair of adjacent circuit forming regions;

a first interconnection region and a second interconnection region, wherein the first interconnection region extends along the first edge and is located between the first edge and the plurality of circuit forming regions, wherein the second interconnection region extends along the second edge and is located between the second edge and the plurality of circuit forming regions; and

a plurality of openings defined in the substrate material, wherein at least one opening is defined in the substrate material between each pair of adjacent circuit forming regions, wherein the at least one opening extends into at least portions of both the first interconnection region and second interconnection region; and

one or more circuits formed in one or more of the circuit forming regions of the substrate material resulting in a packaged individual circuit in each of the one or more circuit forming regions, wherein each packaged individual circuit is formed in the substrate material adjacent the at least one opening.

70. (New) The assembly of claim 69, wherein the substrate material further comprises a first end and a second end, wherein the plurality of circuit forming regions lie along a length of the substrate material between the first end and the second end, the length being defined along a longitudinal axis.

71. (New) The assembly of claim 70, wherein both the first edge and second edge of the substrate material are substantially parallel to the longitudinal axis.

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72. (New) The assembly of claim 70, wherein the at least one opening comprises a first and second opposing end portion with the first end portion thereof lying along a first singulation axis of the substrate material parallel to the longitudinal axis and the second end portion of the at least one opening lying along a second singulation axis of the substrate material parallel to the longitudinal axis.

73. (New) The assembly of claim 70, wherein the at least one opening is a single slot extending generally orthogonal to the longitudinal axis.

74. (New) The assembly of claim 73, wherein at least one packaged individual circuit has a length orthogonal to the longitudinal axis, wherein the at least one opening has a length that is orthogonal to the longitudinal axis, and further wherein the length of the at least one opening is greater than the length of the at least one packaged individual circuit.

75. (New) The assembly of claim 69, wherein the packaged individual circuits comprise ball grid array configurations.

76. (New) The assembly of claim 69, wherein the packaged individual circuits comprise surface mount component configurations.

77. (New) The assembly of claim 69, wherein the at least one opening comprises a slot extending into at least portions of the first and second interconnection regions.

78. (New) The assembly of claim 69, wherein the at least one opening between each pair of adjacent circuit forming regions is configured such that the plurality of circuit forming regions are separable by using a material removal tool operable to move along one or more parallel singulation axes to remove at least portions of the first and second interconnection regions.

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Remarks

The Office Action dated 27 March 2002 has been received and reviewed. Claims 69-78 have been added, and claims 22, 25-26, 28, and 31-32 have been amended. The pending claims are claims 22-63 and 69-78. Reconsideration and withdrawal of the rejections are respectfully requested.

Claim Amendments

Claim 22 has been amended to recite that the substrate material includes a single opening defined in the substrate material between each pair of adjacent circuit forming regions, which is not shown in Takubo et al.

Claims 25-26, 28, and 31-32 have been amended to accurately reflect their dependency on claim 22.

Claims 69-78 have been added to more distinctly claim the present invention so as to more broadly claim the subject matter allowed by the Examiner. It should be understood that each packaged individual circuit includes conductive circuit connection elements, e.g., solder balls, conductive pads, etc. No new matter was added.

The 35 U.S.C. § 102(b) Rejection

The Examiner rejected claims 22-28, 30-41, 43-45, 47-52, 54-60, and 62 under 35 U.S.C. § 102(b) as being anticipated by Takubo et al. (U.S. Patent No. 5,448,451). Applicants traverse this rejection.

However, to further move this case towards issuance, Applicants have amended claims 22, 25-26, 28, and 31-32.

Applicants submit that claims 22-28, 30-41, 43-45, 47-52, 54-60, and 62 as amended are not anticipated by Takubo et al. for at least the following reasons. For a claim to be anticipated under 35 U.S.C. § 102(b), each and every element of the claim must be found in a single prior art reference. See M.P.E.P. § 2131.

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Claims 22-28 and 30-32

Takubo et al. does not anticipate claims 22-28 and 30-32 because Takubo et al. does not teach each and every element of such claims. For example, amended claim 22 recites that the substrate material includes a single opening defined in the substrate material between each pair of adjacent circuit forming regions. In contrast to claim 22, the embodiment of Takubo et al. asserted by the Examiner (i.e., Figure 1) teaches two lead holes (i.e., 7-1 and 7-2) between the alleged pair of adjacent circuit forming regions (i.e., 8-1). The film carrier tape taught by Takubo et al. must include two lead holes between the alleged pair of adjacent circuit forming regions because each pair of driver chips has to have an output-side outer lead hole 7-2 for the output lead wire groups 3-21 and an input-side outer lead hole 7-1 for the input lead wire groups 3-11. Because Takubo et al. does not teach a single opening defined in the substrate material between each pair of adjacent circuit forming regions, Takubo et al. cannot anticipate claim 22.

With regard to claims 23-28 and 30-32, each of which depends, either directly or ultimately, from claim 22, claims 23-28 and 30-32 are not anticipated by Takubo et al. for the same reasons as presented above for claim 22. In addition, claims 23-28 and 30-32 each recite additional elements that further support patentability when combined with claim 22.

For at least the above reasons, Applicants submit that claims 22-28 and 30-32 are not anticipated by Takubo et al. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

Claims 33-41 and 43-45

Takubo et al. does not anticipate claims 33-41 and 43-45 because Takubo et al. does not teach each and every element of such claims. For example, claim 33 recites a circuit board substrate assembly where a singulation axis is defined between each pair of adjacent rows of circuit forming regions.

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In contrast to claim 33, the Examiner alleges that driver chips 8-1 in Figure 1 of Takubo et al. define a row, and that driver chips 8-2 define an adjacent row. However, driver chips 8-1 and 8-2 form a pair which “functions as a single LCD driver chip.” *See* Takubo et al., column 5, lines 4-6. “Each pair of LCD driver chips 8-1 and 8-2 are electrically connected to each other by the lead wire group 3-3 extending in the width direction 5’, thereby effecting the function of the LCD driver.” *Id.* at column 5, lines 6-9. Therefore, adjacent driver chips 8-1 cannot define a row separate from adjacent driver chips 8-2 because chips 8-1 must be connected to chips 8-2 to form “a single LCD driver chip.” *Id.* Further, the film carrier taught by Takubo et al. cannot define a singulation axis between driver chips 8-1 and driver chips 8-2 because each chip 8-1 is “electrically connected” to each chip 8-2. In other words, singulating between chips 8-1 and 8-2 would disconnect each pair of LCD driver chips.

With regard to claims 34-41 and 43-45, each of which depends, either directly or ultimately, from claim 33, claims 34-41 and 43-45 are not anticipated by Takubo et al. for the same reasons as presented above for claim 33. In addition, claims 34-41 and 43-45 each recite additional elements that further support patentability when combined with claim 33.

Claims 47-52 and 54

Takubo et al. does not anticipate claims 47-52 and 54 because Takubo et al. does not teach each and every element of such claims. For example, claim 47 recites a plurality of rows of circuit forming regions of the substrate material aligned parallel to the longitudinal axis. Further, claim 47 recites a singulation axis defined along the length of the substrate material within each of the plurality of interconnections regions.

Takubo et al., on the other hand, does not teach a plurality of rows of circuit forming regions. As stated above in regard to claim 33, the alleged “rows” taught by Takubo et al. are actually pairs of driver chips 8-1 and 8-2 that form a single LCD chip. Therefore, Takubo et al. only teaches a single row of chip sets, not the plurality of rows recited by claim 47. Further, as

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stated above, Takubo et al. does not teach that the film carrier defines a singulation axis because singulating between chips 8-1 and 8-2 would disconnect the pair of chips.

With regard to claims 48-52 and 54, which depend, either directly or ultimately, from claim 47, claims 48-52 and 54 are not anticipated by Takubo et al. for the same reasons as presented above for claim 47. In addition, claims 48-52 and 54 each recite additional elements that further support patentability when combined with claim 47.

For at least the above reasons, Applicants submit that claims 47-52 and 54 are not anticipated by Takubo et al. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

Claims 55-60 and 62

Takubo et al. does not anticipate claims 55-60 and 62 because Takubo et al. does not teach each and every element of such claims. For example, claim 55 recites a plurality of rows of circuit forming regions of the substrate material aligned parallel to the longitudinal axis. Further, for example, claim 55 recites a first singulation axis that lies along the length of the substrate material parallel to the longitudinal axis and is defined in the first interconnection region. The first interconnection region lies along the length of the substrate material parallel to the longitudinal axis and is in between at least one row of individual circuit portions and an adjacent row of individual circuit portions.

In contrast to claim 55, the embodiment alleged by the Examiner (i.e., Figure 1) to anticipate claim 55 does not teach a plurality of rows of circuit forming regions. As stated above in regard to claim 33, Takubo et al. only teaches a single row of driver chip pairs 8-1 and 8-2 that function together as a single LCD chip. Further, as stated above, the film carrier taught by Takubo et al. cannot include a singulation axis as alleged by the Examiner because such an axis would lead to singulation between pairs of driver chips (e.g., chips 8-1 and 8-2), thereby disconnecting the chip pairs.

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With regard to claims 56-60 and 62, which depend, either directly or ultimately, from claim 55, claims 56-60 and 62 are not anticipated by Takubo et al. for the same reasons as presented above for claim 55. In addition, claims 56-60 and 62 each recite additional elements that further support patentability when combined with claim 55.

For at least the above reasons, Applicants submit that claims 55-60 and 62 are not anticipated by Takubo et al. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

The 35 U.S.C. § 102(b)/§ 103(a) Rejection

The Examiner rejected claim 46 under 35 U.S.C. § 102(b) as anticipated by Takubo et al. or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Takubo et al. in view of Lumbard (U.S. Patent No. 5,311,407).

Applicants traverse this rejection and submit that claim 46 is not anticipated by Takubo et al., or, in the alternative, claim 46 is not *prima facie* obvious in view of Takubo et al. and Lumbard.

With regard to the 35 U.S.C. § 102(b) rejection, Applicants submit that claim 46, which ultimately depends from claim 33, is not anticipated by Takubo et al. for the same reasons as presented above for claim 33.

However, the Examiner alleges that claim 46 recites a process limitation in a product claim and cannot serve to patentably define the product over the prior art of Takubo et al. Applicants traverse this allegation. Claim 46 depends from dependent claim 45 and includes all of the elements of claim 45. Claim 45 recites that the at least one opening is configured such that the plurality of circuit forming regions are separable by using a material removal tool operable to move along one or more singulation axes. Applicants submit that claims 45 and 46 are not process claims but instead further define the structure of the assembly of the present invention. In other words, claims 45 and 46 describe the structure of the at least one opening of the assembly.

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For example, claim 45 recites that the at least one opening is configured such that the plurality of circuit forming regions are separable by using a material removal tool operable to move along one or more singulation axes. There are various configurations of openings that may be defined in the substrate material that would not allow the plurality of circuit forming regions to be separated by using a material removal tool operable to move along one or more singulation axes. By limiting the at least one opening in this matter, the structure of the assembly is further defined.

Further, for example, claim 46 recites that the material removal tool includes a routing tool. Because various material removal tools may be used to remove substrate material, a routing tool further defines the singulation axes of the assembly by limiting the types of material removal tools that are operable to move along the one or more singulation axes.

With regard to the 35 U.S.C. § 103(a) rejection of claim 46, Applicants submit that the combination of Takubo et al. and Lumbard does not teach or suggest all of the elements of claim 46. As stated above in regard to claim 33, from which claim 46 ultimately depends, Takubo et al. does not teach all of the elements of claim 33 (e.g., a plurality of rows; a singulation axis). The addition of Lumbard does nothing to correct this deficiency already present in Takubo et al.

For at least the above reasons, Applicants submit that claim 46 is not anticipated by Takubo et al. Further, Applicants submit that claim 46 is not *prima facie* obvious in view of Takubo et al. and Lumbard. Reconsideration and withdrawal of these rejections are, therefore, respectfully requested.

Allowable Subject Matter

Claims 29, 42, 53, and 61 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Applicants have not rewritten claims 29, 42, 53, and 61 at this time because it is believed that the pending claims are allowable in view of the cited references.

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Summary

It is respectfully submitted that the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for
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